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O&OPM-C3

Rev. L

7/11/2019

## **Owner's & Overhaul Procedures Manual**

### **Dart C3 Remote Cargo Hook**

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OWNER'S &amp; OVERHAUL PROCEDURE MANUAL 3000 LBS REMOTE CARGO HOOK C3

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REV. L  
7/11/2019**DETAILS OF REVISIONS**

<b>Rev.</b>	<b>Date</b>	<b>Page</b>	<b>Description</b>	<b>Approved</b>
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		9	Revised Section 3 Introduction	
		13	Added Section 4.4	
B	04/13/11	All	Was Rev A on 02/10/11 Is Rev B on 04/13/11	P. Bravo
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2	08/28/15	18	Revised Section 5.0	J. Gilbert
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3	6/28/16	11	Revised Section 3.0	J. Gilbert
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		17	Revised Warranty	
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		20	Revised Section 6.1	
		32	Revised Section 10.0	
		39	Revised Figure 1	

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7/11/2019**DETAILS OF REVISIONS (Continued)**

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## **Section 1.0: Introduction**

<b>UNIT WEIGHT:</b>	<b>8 lbs. (3.6 kg)</b>
<b>C3 REMOTE CARGO HOOK LIFT CAPACITY:</b>	<b>3,000 lbs. (1,361 kg)</b>

### **1.1 PURPOSE:**

The C3 Remote Cargo Hook has been designed to engage, lift, transport and release external loads off a long line cable suspended from a helicopter. The purpose of this document is to provide the customer with a detailed set of instructions necessary to complete regular maintenance and the overhaul procedure for the C3 Remote Cargo Hook. This may be used as an alternative to sending the C3 Remote Cargo Hook to an approved facility or returning it to Dart Aerospace for overhauls.

#### **WARNING:**

Use only as a long line hook. The C3 Remote Cargo Hook is not certified as a primary or belly hook attached to the helicopter.

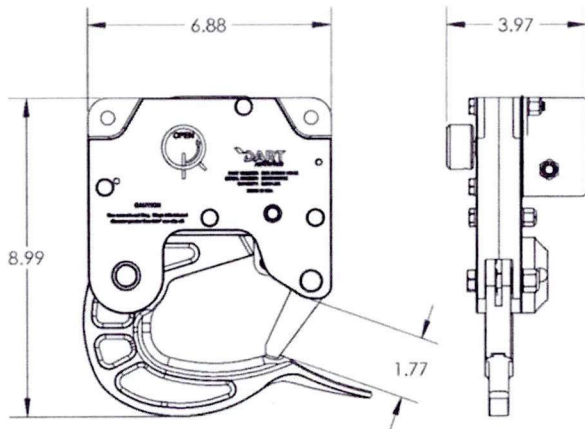


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## 1.2 PRODUCT FEATURE:

The C3 Remote Cargo Hook is encased by a pair of housing plates bolted together. The internal parts are made of high quality steel that has been heat treated and plated.



The toggle mechanism assures the positive lock of the hook, and an amplification of opening forces. The adjustable clock spring allows the load beam to be returned automatically. The stainless steel spring is fully protected from the elements and hazardous snags by a cap that is tapered and attached by four screws. The Loadbeam return tension is set at the factory for the release weight of 7 lbs. but can be variable between 0-12 lbs.

Our standard load beam with oversized throat will accommodate up to 6 eye chokers, 3.25 inches inside diameter maximum. Throat opening is 1.77" (45 mm).

Releasing loads can be performed manually (manual release knob), or electrically (solenoid).

## 1.3 DESIGN FEATURES:

The C3 Remote Cargo Hook contains only five moving parts, far fewer than the competitors model.

Fewer parts mean less down time and reduced maintenance costs.

The housing plates are constructed of high quality aluminum.

Due to the simplified design and parts replacement, Dart Remote Cargo Hooks are easy to service and repair during field maintenance.

Dart Remote Cargo Hooks incorporate the highest quality materials and precision engineering for maximum strength and endurance. Each unit is proof tested prior to shipment.

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## 1.4 PRECAUTIONS

The following precaution definitions will be used to indicate the seriousness of the hazard or condition

**WARNING:** May be a maintenance procedure, practice, condition, etc., which could result in personal injury or loss of life.

**CAUTION:** May be a maintenance procedure, practice, condition, etc., which could result in damage or destruction of equipment.

**NOTE:** May be a maintenance procedure, practice, condition, or a statement that needs to be highlighted.

## 1.5 DEFINITIONS

The following terminology will be used to describe defects and imperfections:

<b>CORROSION:</b>	Chemical action on the surface either resulting in discoloration, a surface of oxide or in an advanced degree of removal of the original surface metal.
<b>CRACK:</b>	Fissure, which does not quite separate the metal.
<b>DENT/NICK:</b>	Depression of surface metal without removal of material.
<b>DISTORTION:</b>	Deviation from original shape.
<b>SCRATCH:</b>	Narrow, shallow marks or lines resulting from movement of a particle or object across a surface.





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## **Section 2.0: Technical Data**

### **2.1 SPECIFICATIONS:**

Lift capacity:	3,000 lbs. (1,361 kg)
Design Ultimate Strength:	11,250 lbs. (5,103 kg)
Minimum release load:	7 lbs. (3.1 kg)
Mounting:	Dual Point
Operational Voltage Range:	24/28 V – D.C.
Max Current:	Type I: 5.7 A Type II: 16.2 A
Resistance Range:	Type I: 4.9 – 5.6 $\Omega$ Type II: 1.7 – 2.0 $\Omega$

#### **WARNING:**

Inner Ring diameter size of 3.25 inches is required.  
For Keeperless option see pp. 18 & 42

### **2.2 DIMENSIONS:**

Weight without Cage:	8 lbs. (3.6 kg)
Height:	9 inches (228 mm)
Thickness:	.81 inches (21 mm) at lifting points 3.97 inches (100 mm) knob to solenoid cover 5.75 inches (146 mm) center of lifting points

### **2.3 RELEASE:**

#### **ELECTRICAL:**

Electrical releases are accomplished by supplying 24 to 28 VDC to a rotary Solenoid for a maximum of 5 seconds. See Section 9.3 SOLENOID INSPECTION for addition specifications.

#### **MECHANICAL (GROUND RELEASE)**

It is possible to release loads to the rated capacity of 3000 lbs. by turning the Manual Release Knob.

#### **WARNING:**

Prior to operating the manual release, make sure that you are not in the path of the load.



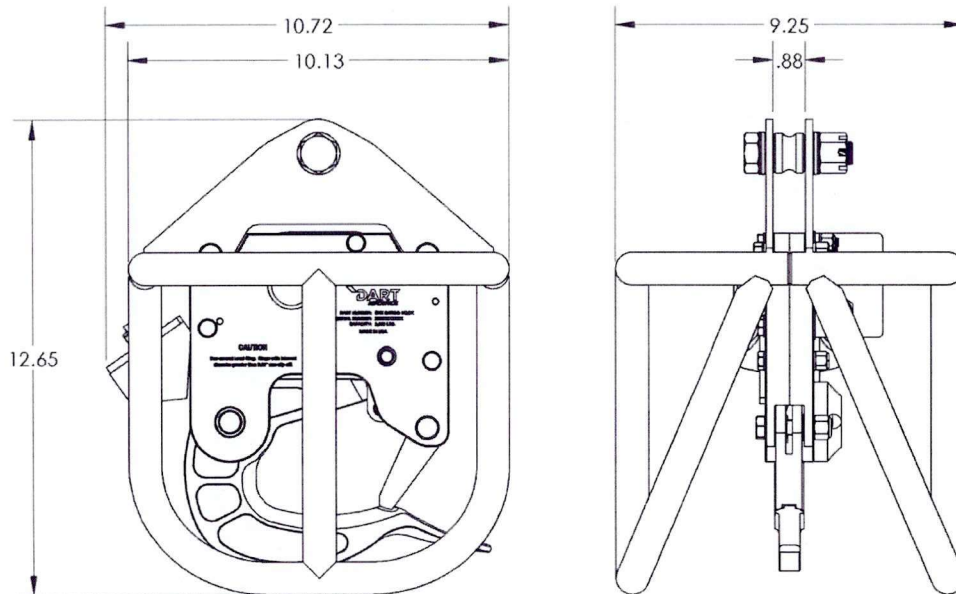


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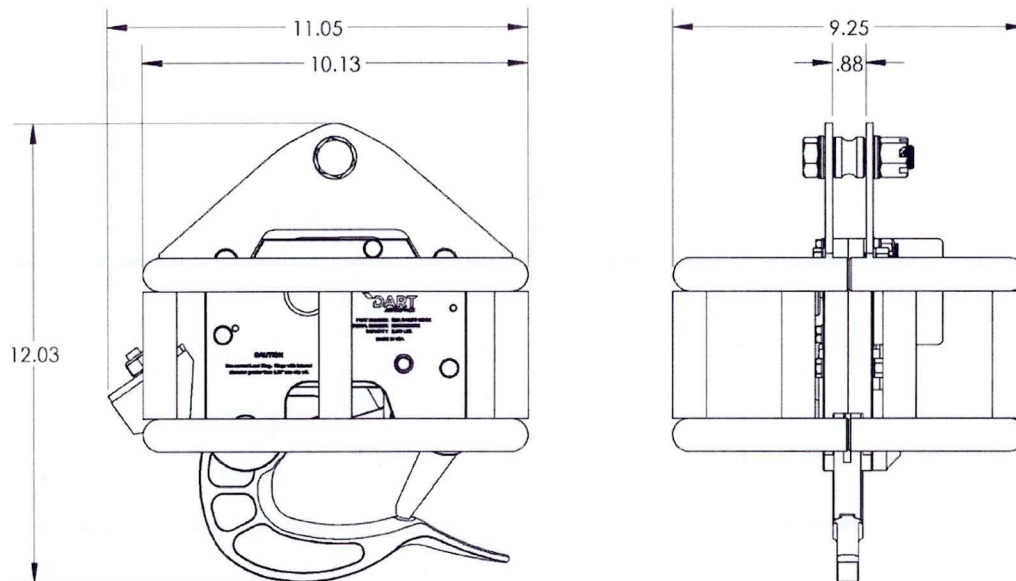
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## 2.4 CAGE SPECIFICATIONS:

Single Hook Cage (C3-C)



Single Hook Ring Cage (C3-RC)



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**2.4.1 Cage Weight:**  
Single Hook Cage (C3-C): 10 lbs. (4.5 kg)  
Single Hook Ring Cage (C3-RC): 8 lbs. (3.6 kg)

**2.4.2 Cage Material:** Steel



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### **Section 3.0: Maintenance**

Care should be exercised during handling of the C3 Remote Cargo Hook to prevent damage to moving or supportive parts. When the hook is in use, clean it daily and apply grease to the end of the load beam, where it engages the lock.

**The overhaul interval for Dart Remote Cargo Hooks is 5 years from the date of purchase or last overhaul or 1,500 hours of operational time, whichever comes first. See Overhaul Procedures starting at section 6.0 pg. 18.**

**Any Dart Remote Cargo Hook showing indications of excessive wear, abuse or damage must be removed immediately for on-condition overhaul or repair prior to scheduled maintenance. The repair and/or overhaul can be performed by an approved facility, returned to Dart Aerospace, or by the Operator using a Dart Aerospace C2 Overhaul Kit (P/N: 648.4702) in accordance with this manual.**

Instructions for Returning Equipment to the Factory:

If a Dart Aerospace Remote Cargo Hook must be returned to the factory for any reason (including returns, service, repairs, overhaul, etc.), return the components freight, cartage, insurance and customs prepaid to:

DART AEROSPACE LTD.  
1270 Aberdeen Street  
Hawkesbury, ON, K6A 1K7  
CANADA  
Tel: 1 613 632 5200



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### **3.1 INSPECTION:**

- Conduct a visual inspection of the outside the Remote Cargo Hook. Check for nicks, burrs, cracks or looseness of parts.
- Ensure that the mechanism works, rotating the Manual Release Knob, while applying hand pressure on the Load Beam.
- Electrically: use an OHM-meter, check the continuity and resistance of the solenoid. See Section 9.3 SOLENOID INSPECTION for specifications.

### **3.2 DISASSEMBLY:**

Tools Required:

3/8 socket wrench  
7/16 socket wrench  
7/16 wrench  
9/16 wrench  
9/16 socket wrench  
3/32 Allen wrench  
Phillips Screwdriver  
Snap ring pliers

- Loosen housing nuts 4 places and keeper nut.
- Remove Manual Release Knob.
- Take off Manual Release Knob Side plate (opposite solenoid side).
- Remove parts one piece at a time, clean off grease and grime using mild cleaning solvent or bath.
- Blow off excessive cleaner and towel dry.

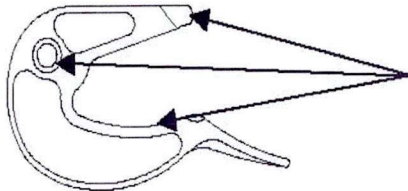


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### 3.3 VISUAL INSPECTION:

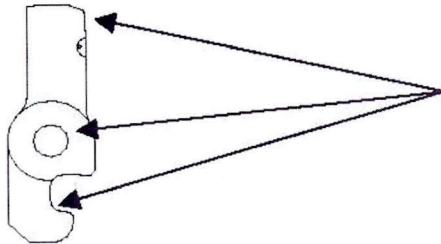
Visually inspect parts for wear on areas listed below:



#### 3.3.1 Load Beam:

Nose, Trunnion and Choker areas

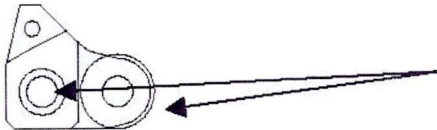
Load beam nose should be smooth and free of burrs or divots caused by lock. Angle should be set as per manufacturer's specifications. Trunnion should remain pressed in and not wobbly.



#### 3.3.2 Lock:

Latch roller, Load beam and Lock shaft contact areas

Lock at Load Beam face should remain smooth and at the proper angle. Contact point where latch roller contacts the load beam should not be distorted.



#### 3.3.3 Latch:

Roller, pivot hole and bearings.

Latch roller rotation and divots on roller surface. Latch side plate bearings should have smooth rotation.



#### 3.3.4 Link:

Link holes should be checked for elongation and worn pins. Bushings should be checked for fitting into side plates and for hole elongation. Pins should be checked for wear and fitting.





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### **3.4 SOLENOID REMOVAL:**

(Optional) If the "Solenoid quick removal" feature is not equipped; the opening of the hook is necessary to remove the hex head nuts from the solenoid's studs.

- 3.4.1 Remove solenoid cover.
- 3.4.2 Pull out solenoid. The solenoid is located in place by round nuts mounted on the studs and held in place by the cover. Notice the rubber pad on the top of the cap. This gets pinched by the cover and held in place when the bolts are tight.
- 3.4.3 If any areas show signs of wear or over use replace parts or send unit back for evaluation and overhaul.

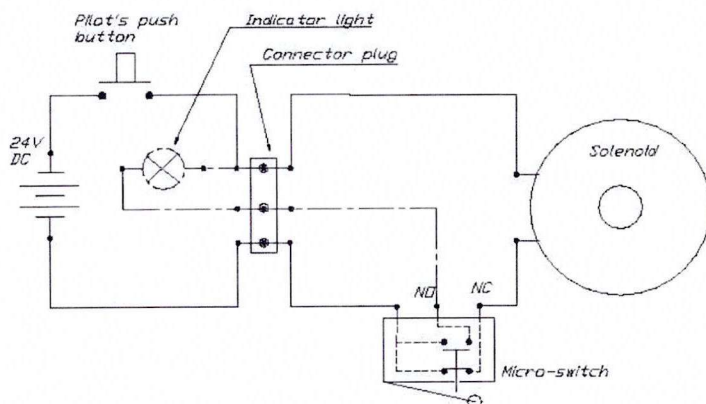
### **3.5 ASSEMBLY:**

- 3.5.1 Work in reverse order of disassembly.
- 3.5.2 Ensure all parts are clean and greased when installing components.

### **3.6 CYCLE TEST:**

If the C3 Remote Cargo Hook must be disassembled for any reason, it is necessary to perform a load test prior to returning to service.

- 3.6.1 Engage a poly-urethane rope or steel cable in the throat of the load beam with an attached weight of 250-500 lbs. The load beam should be free to lock back into the closed position between cycles. Lift and release the load a minimum of 3 times to ensure proper function.

**Section 4.0: Miscellaneous Information****4.1 WIRING DIAGRAM (Optional):**

The pilot's push button switch for release is preferably mounted in one of the control levers for operation, so it can be operated without removal of the hands from the controls. To prevent unintentional operation, a guard may be mounted over the control button or a safety shut-off switch can be inserted in the circuit.

The circuit contains the solenoid safety micro-switch (Normally Closed – NC) that cuts the power off the solenoid in the open position of the release mechanism, and an optional wiring can be provided for an OPEN position indicator light (using the Normally Open–NO contact of the micro-switch).

Standard wiring installation has been left to the operator's discretion.

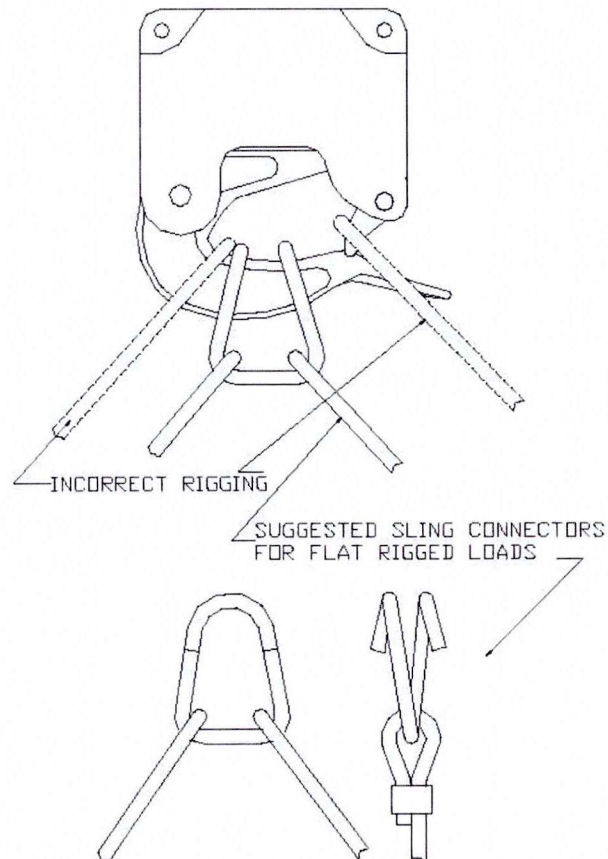


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## 4.2 RIGGING:

When cable angle is flatter than  $45^\circ$ , a connector is recommended.



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#### **4.3 LIMITED WARRANTY:**

Dart Aerospace warrants to the original customer and or owner, that the product will be free from defects in workmanship and materials, under normal use and services for which each product is intended for the warranty periods listed below from the date of delivery. Warranty shall be granted provided the product has been transported, stored, protected, unloaded, maintained and operated strictly in accordance with Dart Aerospace's instructions and/or manuals and that no unauthorized repairs have been attempted. The Dart Aerospace warranty stated herein is intended for new products and aftermarket services sold through Dart Aerospace or its Subsidiaries (Authorized Service Centers or Authorized Distributors). Internal components installed and manufactured from other manufacturers are not covered by Dart Aerospace and are subject to OEM warranties. Dart Aerospace reserves the right to evaluate the product and determine if the unit is subject to warranty.

##### **New Product Sales:**

The period of warranty for new product sales is One (1) calendar year from the date of delivery to the customer.

##### **Services:**

The period of warranty for Repair, Overhaul, or Exchange Services is Six (6) calendar months from the date of delivery to the customer.





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#### **4.4 KEEPERLESS ADAPTER (OPTIONAL):**

The Dart Model C3-K Remote Cargo Hook includes a keeperless adapter in which the Keeper remains fixed in place at all times, which allows the operator to use a variety of different ring sizes and/or rigging. Any Remote Cargo Hook with the Keeperless option retains the same manual/electrical release capabilities.

All information presented in this document is applicable to both the Model C3 and C3-K Remote Cargo Hooks. The only notable exception comes in Section 5.0: C3 Parts List; Part numbers C3-4-4A (Load Beam Assembly), C3-13-4 (Keeper), and C3-13-5 (Keeper Spring) are exclusive to the Model C3 Remote Cargo Hook, while part numbers C3-4-4KA (C3 Keeperless Load Beam Assembly) C3-13-4-2 (Keeperless Adapter) is exclusive to the Model C3-K Remote Cargo Hook.





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## **Section 5.0: Parts Lists**

### **5.1 C3 PARTS LIST:**

See Figure 1

PART#	NAME	QTY.
C2-1-1	Manual Release Knob	1
C2-3-1	Bearing DU	2
C2-3-2	Latch Roller Pin	1
C2-3-2-1	Retaining Ring	2
C2-3-3	Latch Roller	1
C2-3-3-1	Latch Roller DU Bearing	1
C2-3-5	Spacer	2
C2-3-6	Latch	1
C2-3-8	Actuator Bushing	2
C2-3-10	Latch Shaft	1
C2-3-11	Actuator	1
C2-5-1	Actuator Stop, Dowel	1
C2-10-1	Spring Pin	1
C2-11-2	Locating Pin	2
C2-14-2	Label Rivets (not shown)	2
C3-2-1	Side Plate	1
C3-3-4	Link Pin	2
C3-3-4-1	Retaining Ring	4
C3-3-7	Link	1
C3-3-9	Actuator Spring	1
C3-4-1	Load Beam Bushing	2
C3-4-4A	Load Beam Assembly	1
C3-7-1	Load Beam Bumper	1
C3-7-2	Lock Bumper	2
C3-8-2	Solenoid Assembly (Figure 4)	1
C3-8-2-1	Solenoid	1 per C3-8-2
C3-8-2-2	Solenoid Pin Spacer	1 per C3-8-2
C3-8-3	Spring Pin	1 per C3-8-2
C3-8-3-1	Spacer	1 per C3-8-2
32446	22-16 AWG Knife Connector	2 per C3-8-2
C3-8-4	Solenoid Cover Gasket	1
C3-8-5	Solenoid Cover	1
C3-9-1	Clock Spring Cover	1
C3-9-2	Clock Spring	1

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C3-10-2	Lock Spring	1
C3-11-1	Side Plate-Solenoid Side	1
C3-12-1	Lock Bushing	2
C3-12-2	Lock Shaft	1
C3-12-3	Lock	1
C3-12-4	Lock Roller	1
C3-12-5	Lock Roller Pin	1
C3-12-6	Lock Roller Retaining Ring	2
C3-13-1	Keeper DU-Bearing Bushing	2
C3-13-4	Keeper	1
C3-13-5	Keeper Spring	1
CORD GRIP	Cord Grip	1
EL-PLUG-M	Male Plug (not shown)	1
M27500-16TG2T14	Wire (not shown)	1 FT
600.1309	Label (not shown)	1
600.1313	Caution Sticker (not shown)	1
188-FSCS-832-5/8	Clock Spring Cover Screw	4
188-FPSS-1032-1/4	Set Screw	2
AN4-16A	Screw	3
AN4-17A	Screw	1
AN6-15A	Keeper Shaft Bolt	1
AN960-10	Washer	1
AN960-10L	Washer	2
AN960-416	Washer	8
AN960-616L	Keeper Washer, Low Profile	2
MS21044N4	Locknut	4
MS21083N3	Self-Locking Nut	2
MS21083N6	Keeper Nut	1
MS35266-63	Solenoid Cover Screw	1
32446	22-16 AWG Knife Connector (not shown)	2
	Heat Shrink Tube (not shown)	1

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## 5.2 C3-C PARTS LIST:

See Figure 6

PART#	NAME	QTY.
C3-C-8	Lifting Bushing	1
C3-C-9	Bumper	1
MS21042-6	Cage Bumper Nut	1
NAS1149F0663P	Cage Bumper Washer	2
C3-C-4	Weldment	1
AN10-22	Lifting Bolt	1
NAS1149F1032P	Lifting Bolt Washer	2
MS24665	Cotter Pin	1
AN6-17A	Cage Bolt	2
AN310-10	Lifting Bolt Nut	1
NAS1149F0663P	Cage Bolt Washer	4
MS21044N6	Cage Bolt Nut	2
NAS1351-6-28	Cage Bumper Bolt	1

## 5.3 C3-RC PARTS LIST:

See Figure 7

PART#	NAME	QTY.
C3-18C	Ringed Cage Weldment	1
C3-18-7	Lifting Bushing	1
C3-18-9	Bumper	1
C3-18-10	Cage Bumper Nut	1
C3-18-11	Cage Bumper Washer	1
C3-19-1	Lifting Bolt	1
C3-19-3	Lifting Bolt Washer	2
C3-19-4	Cotter Pin	1
AN6-17A	Cage Bolt	2
AN310-10	Lifting Bolt Nut	1
AN960-616	Cage Bolt Washer	4
MS21044N6	Cage Bolt Nut	2

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## **Section 6.0: Overhaul Preparation**

Before the overhaul process may begin, the following preparations must be made.

### **6.1 REQUIRED ITEMS**

The following items are required to complete the overhauling process as outlined in this manual:

- **Dart Aerospace C3 Overhaul Kit (P/N: 648.4702)**
- **Loctite #620 Retaining Compound**
- **Aeroshell Grease 7**
- **SAF-T-EZE Copper Anti-Seize (or equivalent)**
- **Vinyl Electrical Tape**
- **Standard Multimeter**
- **Parts Washing Solvent**
- **Aluminum Oxide 100/200/400, or Scotch Brite (or similar)**
- **Raychem RNF-100 Heat-Shrink Tubing .25"exp - .125"rec (or equivalent)**

### **6.2 PARTS LIST AND ASSEMBLY FIGURES**

A copy of the complete parts list and assembly figures are included in this document and may be used as a reference source at any time.

Table 6.2 below lists all the parts contained in the Dart Aerospace C3 Overhaul Kit (P/N: 648.4702). It is recommended that this table be used to verify that all parts are present.

<b>PART#</b>	<b>NAME</b>	<b>QTY. (648.4702)</b>
188-FPSS-1032-1/4	Set Screw	2
AN4-16A	Screw	3
AN960-416	Washer	8
MS21044N4	Locknut	4
AN4-17A	Screw	1

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C2-3-1	Bearing DU	2
C2-3-2-1	Retaining Ring	2
C2-3-3-1	Latch Roller DU Bearing	1
C3-3-4-1	Retaining Ring	4
C2-3-5	Spacer	2
C2-3-8	Actuator Bushing	2
C3-3-9	Actuator Spring	1
C3-4-1	Load Beam Bushing	2
C3-7-1	Load Beam Bumper	1
C3-7-2	Lock Bumper	2
MS21083N3	Self-Locking Nut	2
AN960-10L	Washer	2
C3-8-4	Solenoid Cover Gasket	1
MS35266-63	Solenoid Cover Screw	1
AN960-10	Washer	1
188-FSCS-832-5/8	Clock Spring Cover Screw	4
C3-10-2	Lock Spring	1
C3-12-1	Lock Bushing	2
C3-12-6	Lock Roller Retaining Ring	2
C3-13-1	Keeper DU-Bearing Bushing	2
AN6-15A	Keeper Shaft Bolt	1
MS21083N6	Keeper Nut	1
AN960-616L	Keeper Washer, Low Profile	2
C3-13-5	Keeper Spring	1
600.1309-A	Label (not show)	1
C2-14-2	Label Rivets (not shown)	2
600.1313	Caution Sticker (not shown)	1

**Table 6.2 – Dart Aerospace C3 Overhaul Kit Parts List**

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## **Section 7.0: Overhaul Disassembly**

These procedures are for the complete disassembly of the C3 Remote Cargo Hook.

**NOTE:** The term "Remove" implies the temporary separation and/or un-installation of parts which are then reused later in the overhaul. The term "Discard" implies the permanent disposal of a part and is reserved only for components which have a replacement found in the Dart Aerospace C3 Overhaul Kit.

- 7.1 Remove and discard the Solenoid Cover Screw (MS35266-63) and the Washer (AN960-10).
- 7.2 Remove and discard the Screw (AN4-17A), the two (2) Washers (AN960-416), and one (1) Locknut (MS21044N4).
- 7.3 Remove the Solenoid Cover (C3-8-5) and the Solenoid Cover Gasket (C3-8-4). Discard the Solenoid Cover Gasket.
- 7.4 Remove and discard the two (2) Set Screws (188-FPSS-1032-1/4) securing the Manual Release Knob.
- 7.5 Remove the Manual Release Knob (C2-1-1).
- 7.6 Remove and discard the two (2) Label Rivets (C2-14-2). Remove the Label (600.1309).

**NOTE:** If the writing on the Label is clearly legible (i.e. the label is free from any major scratches, nicks, and/or dents) it may be reused. If not, stamp all label information onto the blank Label (600.1309-A) included in the Dart Aerospace C3 Overhaul Kit and discard the old label.

- 7.7 Remove and discard the Keeper Shaft Bolt (AN6-15A), the Keeper Nut (MS21083N6), and the two (2) Keeper Washers, Low Profile (AN960-616L).

**NOTE:** Temporarily set the old Keeper Shaft Bolt (AN6-15A) aside so that it may be used to aid in the installation of the new Keeper Shaft Bolt later in the overhaul process. Be sure that this bolt is clearly identifiable as the old bolt.

- 7.8 Remove the Keeper (C3-13-4) and the Keeper Spring (C3-13-5). Discard the Keeper Spring.



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- 7.9 Remove and discard the three (3) remaining Screws (AN4-16A), three (3) Locknuts (MS21044N4), and six (6) Washers (AN960-416).
- 7.10 With the Side Plate-Solenoid Side (C3-11-1) face down, separate and remove the Side Plate (C3-2-1) exposing the entire inner mechanism. Be careful not to disturb the parts inside.
- 7.11 Remove and discard the Load Beam Bumper (C3-7-1) and the two (2) Lock Bumpers (C3-7-2).
- 7.12 Remove and completely disassemble the Lock Assembly. Discard the two (2) Lock Roller Retaining Rings (C3-12-6) and the Lock Spring (C3-10-2).
- 7.13 Remove the Latch and Actuator Shaft Assembly, with the exception of the two (2) Actuator Bushings (C2-3-8) and the two (2) Bearing DUs (C2-3-1); these bushings are to remain in their respective side plates.
- 7.14 Completely disassemble the Latch and Actuator Shaft Assembly. Discard the two (2) Spacers (C2-3-5), the Actuator Spring (C3-3-9), the four (4) Retaining Rings (C3-3-4-1), the two (2) Retaining Rings (C2-3-2-1), and the Latch Roller DU Bearing (C2-3-3-1).
- NOTE: The Latch Roller DU Bearing (C2-3-3-1) is pressed inside the Latch Roller (C2-3-3). It is recommended that an arbor press be used with an appropriately sized punch to separate these components.
- 7.15 On the opposite side of the Solenoid Side Plate, remove and discard the four (4) Clock Spring Cover Screws (C3-9-3).
- NOTE: The spring is turned clockwise about one half turn. Be sure to hold the cover in place while removing screws.
- 7.16 Remove the Clock Spring Cover (C3-9-1) and Clock Spring (C3-9-2).
- 7.17 Remove Load Beam Assembly (C3-4-4A).
- 7.18 Remove and discard the two (2) Self-Locking Nuts (MS21083N3) and two (2) Washers (AN960-10L) holding the Solenoid Assembly (C3-8-2) in place. Remove the Solenoid Assembly.



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- 7.19 On the Solenoid wires, carefully remove and discard the layer of shrink tubing covering the terminal connections. Do not remove the terminal fittings. In the event that a terminal fitting needs replacing, use a 22-16 AWG Knife connector.
- 7.20 Remove the Dust Cap (C3-8-3-1).
- 7.21 Remove the two (2) Locating Pins (C2-11-2), the Actuator Stop, Dowel (C2-5-1), and the Spring Pin (C2-10-1) from the Solenoid Side Plate.

**CAUTION:** Pin press fittings may be very tight. Avoid excessive bending during removal, as this may result in permanent deformation or damage to the Pins and/or Side Plate. If any of the pins are too difficult to remove, leave them in place and proceed to the next step.

- 7.22 Remove the Bearing DU (C2-3-1), the Actuator Bushing (C2-3-8), the Load Beam Bushing (C3-4-1), the Lock Bushing (C3-12-1), and the Keeper DU-Bearing Bushing (C3-13-1) from the Side Plate-Solenoid Side (C3-11-1) using an arbor press and the appropriately sized bushing punches.

Remove the Bearing DU (C2-3-1), the Actuator Bushing (C2-3-8), the Load Beam Bushing (C3-4-1), the Lock Bushing (C3-12-1), and the Keeper DU-Bearing Bushing (C3-13-1) from the Side Plate (C3-2-1) using an arbor press and the appropriately sized bushing punches.

Discard all bushings and bearings.

- 7.23 Remove and discard the Caution Sticker (600.1313) from the Side Plate (C3-2-1), if applicable.





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## **Section 8.0: Overhaul Cleaning**

The Following cleaning instructions should be performed as described after completing Section 7.0. All dust, dirt, corrosion, rust and moisture must be removed, to prevent operational failure of the Remote Cargo Hook.

### **8.1 GENERAL CLEANING PROCEDURES**

- 8.1.1 Clean all metal parts with parts washing solvent or equivalent. Remove caked on dirt with a stiff-bristle or non-metallic brush.

**CAUTION:** Because the solenoid is an electric component, do not use excessive amounts of solvent, or similar. Clean by hand.

- 8.1.2 Dry all parts thoroughly with a lint free cleaning cloth and blow off extra cleaning materials from hard to reach areas.

- 8.1.3 Ensure that all parts are free of rust, corrosion and abrasive matter. Remove minor surface corrosion, scratches and imperfections by polishing lightly with abrasive cloth.





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## **Section 9.0: Overhaul Check and Inspection**

### **9.1 PARTS REPLACEMENT**

**NOTE:** This section is mandatory.

Ensure that the following parts have been properly discarded (as per section 7.0) and replaced with the parts (if applicable) found in the Dart Aerospace C3 Overhaul Kit:

- All hardware (nuts, bolts, washers, screws, retaining rings)
- All nylon spacers
- All bearings
- All gaskets
- All bumpers
- Solenoid nuts, pin & retaining rings
- All springs (Except Clock Spring)
- All updated parts
- Labels, Rivets, and stickers (if applicable)
- Trunnion Lock Bushings

### **9.2 VISUAL INSPECTION**

**NOTE:** This section is mandatory.

Visually inspect all parts for wear and tear. Any component showing excessive wear, abuse, cracks, corrosion, or damage must be removed and replaced before overhauling can resume. The following parts should be given special attention as outlined below.

#### **9.2.1 Latch**



Check for Latch Roller rotation and divots on roller surface. Latch side plate bearings should have smooth rotation.

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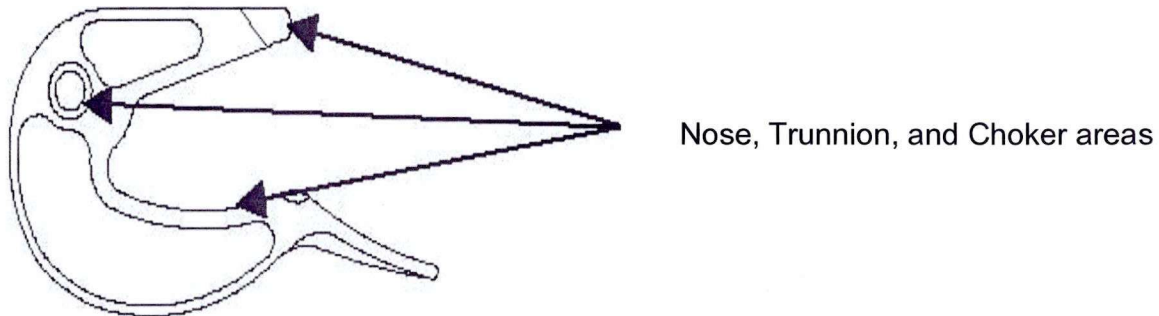
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### 9.2.2 Link



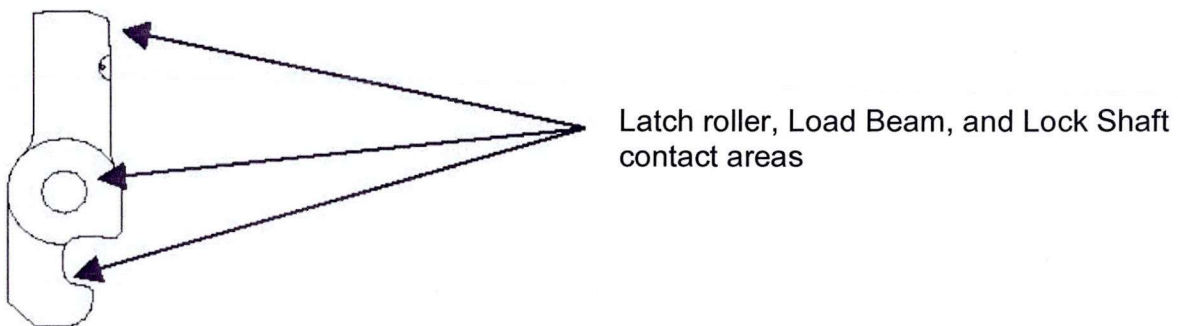
Check for elongation and worn pins. Bushings should be checked for fitting into side plates and for hole elongation. Pins should be checked for wear and fitting.

### 9.2.3 Load Beam



Load beam nose should be smooth and free of burrs or divots caused by lock. Trunnion should remain pressed in and not loose.

### 9.2.4 Lock



Load Beam face should remain smooth and free of burrs or divots. Contact point where latch roller contacts the load beam should not be distorted.

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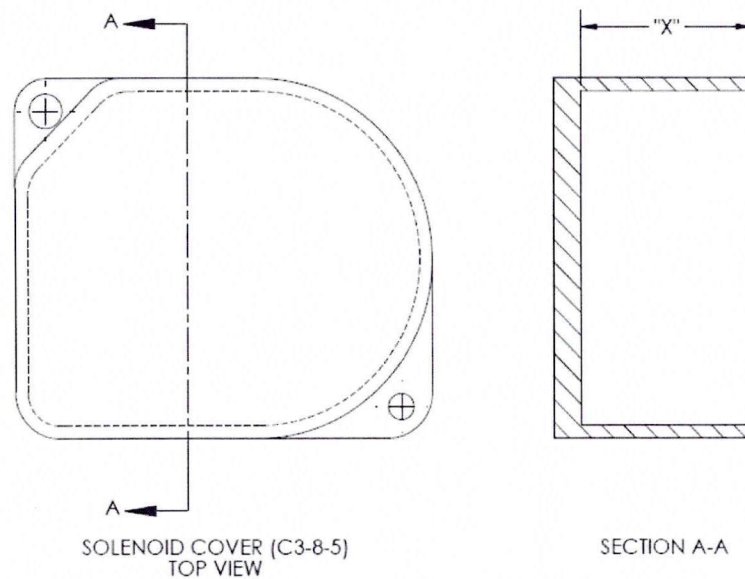
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### 9.3 SOLENOID INSPECTION

NOTE: This section is mandatory.

There are two (2) different types of Solenoid models used on the C3 Remote Cargo Hook. Use the following criteria to determine if you have the Type I model Solenoid, or the Type II model Solenoid.

Using the Solenoid Cover (C3-8-5), measure the height of the inner surface (Distance "X") as shown below in Figure 9.3. Type I Solenoids have a cover height of "X" = 1.50 in. Type II Solenoids have a cover height of "X" = 1.70 in.



**Figure 9.3 - Solenoid Sizing**

Ensure that the Solenoid has been thoroughly cleaned and re-greased, then connect an ohmmeter to the wire leads. Solenoid resistance for Type I Solenoids must be 4.9 to 5.6  $\Omega$ . Solenoid resistance for Type II Solenoids must be 1.7 to 2.0  $\Omega$ . If the resistance is less, or more, there is a possible short which may result in too much current draw and overheat the unit.

If the resistance criteria listed above cannot be satisfied, the Solenoid must be replaced.



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## 9.4 NON-DESTRUCTIVE TESTING

**NOTE:** This section is mandatory.

The following parts must be sent out for NDT (Non Destructive Testing) and replaced upon failure:

- Both Side Plates
- Load Beam
- Actuator Shaft
- Link
- Link Pins
- Latch
- Latch Roller
- Latch Roller Pin
- Latch Shaft
- Lock
- Lock Shaft
- Lock Roller
- Lock Roller Pin

## 9.5 PLATING

The following parts are subject to re-plating only when necessary due to wear and plating loss:

- Actuator Shaft
- Link
- Latch
- Lock
- Load Beam Assy\*
- Keeper
- Latch Shaft
- Lock Shaft

**NOTE:** Some newer parts will not require plating; the Latch, Actuator Shaft, and Link may be made out of stainless steel.

**NOTE:** Apply electroless nickel plate to a thickness of .0004in to .0006in. Bake as required for hydrogen embrittlement relief.

\* Thickness of .0009in to .0011in.





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## **Section 10.0: Overhaul Re-Assembly**

**NOTE:** Ensure that the previous section has been properly completed before beginning the re-assembly process outlined below.

### **10.1 SIDE PLATE PREPARATION**

- 10.1.1 Apply Loctite to faying surfaces of the Bearing DU (C2-3-1) and the Side Plate-Solenoid Side (C3-11-1) and press in place. Ensure that the ends of the Bearing DU are flush to the cavity surface of the side plate.
- 10.1.2 Apply Loctite to faying surfaces of the Actuator Bushing (C2-3-8), the Load Beam Bushing (C3-4-1), the Lock Bushing (C3-12-1), the Keeper DU-Bearing Bushing (C3-13-1), and the Side Plate-Solenoid Side (C3-11-1) and press in place. Ensure that all bushings are flush, or below, the surface of the side plate. Remove any excess Loctite from side plate.
- 10.1.3 Repeat steps 10.1.1 and 10.1.2 for the MRK Side Plate (C3-2-1).
- 10.1.4 Apply grease to faying surfaces of the two (2) Locating Pins (C2-11-2), the Actuator Stop, Dowel (C2-5-1), the Spring Pin (C2-10-1), and the Side Plate-Solenoid Side. Press in place and remove any excess grease.
- 10.1.5 Apply grease to faying surfaces of the Load Beam Bumper (C3-7-1), the two (2) Lock Bumpers (C3-7-2), and the Solenoid Side Plate (C3-11-1). Press in place and remove any excess grease.

### **10.2 SOLENOID ASSEMBLY INSTALLATION**

- 10.2.1 Re-install the Dust Cap (C3-8-3-1) and temporarily install the Solenoid Assembly onto the back (outer facing surface) of the Solenoid Side Plate and check that neither end of the Solenoid Pin (C3-8-3) comes in contact with the Actuator Bushing (C2-3-8). Remove and adjust as necessary.

**NOTE:** When installed, the wires extending from the Solenoid Assembly should be pointing down (i.e. towards the Load Beam [not yet installed]).

- 10.2.2 Install the Solenoid Assembly (C3-8-2) using Self-Locking Nuts (MS21083N3) and Washers (AN960-10L). Torque to 30 in. lbs.

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- 10.2.3 Using a small brush or Q-Tip, apply grease to the Solenoid bearing surface between the housing and shaft and the inside of the Actuator Bushing (C2-3-8).

**10.3 LATCH & ACTUATOR SHAFT ASSEMBLY INSTALLATION**

- 10.3.1 Apply Loctite to faying surfaces of the Latch Roller DU Bearing (C2-3-3-1) and the Latch Roller (C2-3-3) and press in place. Grind down the ends of the Latch Roller DU Bearing until it is flush to the surface of Latch Roller. Deburr and remove any sharp edges and excess Loctite.
- 10.3.2 Fit the Latch Roller Pin (C2-3-2) into Latch Roller DU Bearing (C2-3-3-1). Polish pin if necessary.
- 10.3.3 Fit the assembled roller into the Latch (C2-3-6) and check to make sure there is clearance. The roller should not rub on the inside of the Latch. If it does, return to step 10.3.1 and repeat grinding process.
- 10.3.4 Install Retaining Rings (C2-3-2-1) on each end of the Latch Roller Pin (C2-3-2).
- 10.3.5 Install one end of the Link (C3-3-7) to the Latch Assembly using a Link Pin (C3-3-4). Install Retaining Rings (C3-3-4-1) on each end of the Link Pin.
- 10.3.6 Install the opposite end of the Link (C3-3-7) to the Actuator (C2-3-11) using a Link Pin (C3-3-4). Install Retaining Rings (C3-3-4-1) on each end of the Link Pin.
- 10.3.7 Apply grease to inner surface of the Bearing DU (C2-3-1).
- 10.3.8 Insert Latch Shaft (C2-3-10) into the Latch and place a Spacer (C2-3-5) onto both ends of the Latch Shaft. Apply grease to all faying surfaces and hold in place.
- 10.3.9 Place the Actuator Spring (C3-3-9) onto the Actuator (C2-3-11) and hold in place.
- 10.3.10 Install the Latch & Actuator Shaft Assembly onto the Side Plate-Solenoid Side (C3-11-1).



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**NOTE:** Be sure that both the Nylon Washers and the Actuator Lever Spring remained in the correct position during installation.

10.3.11 Ensure free and proper movement when the Actuator is rotated from side-to-side. The Actuator should rest on the Actuator Stop Pin when in the closed position.

10.3.12 Grease all Latch & Actuator Shaft Assembly parts.

#### **10.4 LOCK ASSEMBLY INSTALLATION**

10.4.1 Install the Lock Roller (C3-12-4) onto Lock (C3-12-3) using the Lock Roller Pin (C3-12-5). Check to make sure that there is clearance between the Lock Roller and the Lock.

10.4.2 Insert the Lock Roller Retaining Rings (C3-12-6) on each end of the Lock Roller Pin (C3-12-5).

10.4.3 Attach one end of the Lock Spring (C3-10-2) to the spring hole on the Lock.

10.4.4 Temporarily insert the Lock Shaft (C3-12-2) into Lock and ensure that it is a slip fit.

10.4.5 Apply grease to the inner surface of the Lock Bushing (C3-12-1) on the Side Plate-Solenoid Side (C3-11-1) and install the Lock Shaft (C3-12-2) (separate from Lock Assembly).

10.4.6 Align the Lock Assembly with the Lock Shaft (C3-12-2) and install onto to Side Plate-Solenoid Side (C3-11-1). Apply grease to faying surfaces.

10.4.7 Loop the free end of the Lock Spring (C3-10-2) around the Spring Pin (C2-10-1) and slide it down into place.

10.4.8 Apply grease over the entire surface of the Lock Roller (C3-12-4). Apply grease onto the Lock surface that comes in contact with the Latch Roller (C2-3-3).





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## 10.5 PARTS INSTALLATION

- 10.5.1 Apply grease to the inner surface of the Load Beam Bushing (C3-4-1) and install the Load Beam Assembly (C3-4-4A) onto the Side Plate-Solenoid Side (C3-11-1).

**NOTE:** At this point, test to make sure the Load Beam will latch into place correctly as well as release properly. Once it is determined that all inner mechanisms are functioning properly return the Load Beam to its locked position.

- 10.5.2 Temporarily insert the old Keeper Shaft Bolt (AN6-15A) from step 7.7 through the Keeper Bushing (C3-13-1) on the Side Plate-Solenoid Side (C3-11-1).
- 10.5.3 Align the Keeper Spring (C3-13-5) with the Keeper (C3-13-4) and insert into place using the temporarily installed Keeper Shaft Bolt.
- 10.5.4 Apply grease to the Bearing DU (C2-3-1), Actuator Bushing (C2-3-8), Load Beam Bushing (C3-4-1), Lock Bushing (C3-12-1), and Keeper DU-Bearing Bushing (C3-13-1).
- 10.5.5 Install the Side Plate (C3-2-1) and remove any excess grease from the exterior surfaces.

**NOTE:** Ensure that the Keeper Spring remained in the proper position during placement of the Side Plate.

- 10.5.6 Turn the hook assembly over and install the Clock Spring (C3-9-2) and Clock Spring Cover (C3-9-1) making sure that the Clock Spring tang is properly seated in the slot of the Load Beam Assembly (C3-4-4A). Apply grease to all Clock Spring faying surfaces.
- 10.5.7 Turn the hook assembly over and install the Manual Release Knob (C2-1-1) using the two (2) Set Screws (188-FPSS-1032-1/4). The Set Screws must bottom out on the notch. Use Anti-Seize on screws.
- 10.5.8 Apply Anti-Seize to the new Keeper Shaft Bolt (AN6-15A). Insert one (1) Keeper Washer, Low Profile (AN960-616L) onto the new Keeper Shaft Bolt and use it to replace the existing Keeper Shaft Bolt by simultaneously pushing the old bolt out and the new bolt in. Discard the old Keeper Shaft Bolt.





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- 10.5.9 Install one (1) Keeper Washer, Low Profile (AN960-616L) and Keeper Nut (MS21083N6) and tighten, no torque limit.
- 10.5.10 Apply Anti-Seize to the three (3) Screws (AN4-16A) and install. Place on and tighten all washers and nuts to 50 in. lbs. of torque.
- NOTE: Do not install the Screw (AN4-17A) that goes through the Solenoid Cover (C3-8-5).
- 10.5.11 On the Solenoid, ensure that all wires are connected as required and apply shrink tubing over exposed terminal connections. Wiring should be reconnected with the Cord Grip (CORD GRIP), already mounted to the solenoid cover.
- 10.5.12 Install the Solenoid Cover (C3-8-5) and the Solenoid Cover Gasket (C3-8-4) with the Solenoid Cover Screw (MS35266-63), the Washer (AN960-10), and a Screw (AN4-17A) with Washers (AN960-416) and Locknut (MS21044N4).
- 10.5.13 Rotate the Clock Spring Cover in a clockwise motion (about one half turn) until the set screw holes are aligned. Install the four (4) Clock Spring Set Screws (C3-9-3). See section 11.1.3 for final adjustments.
- NOTE: C3-K Model Clock Springs set to have no tension.
- 10.5.14 Use two (2) Label Rivets (C3-14-2) to attach the Label (600.1309-A) on the Side Plate (C3-2-1), if applicable. The serial numbers should be stamped on the label prior to installation.
- 10.5.15 Place Caution Sticker (600.1313) on the front vertical face of the Side Plate (C3-2-1), if applicable.



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## **Section 11.0: Overhaul Assembly Inspection, Testing, and Checkout**

This section provides information and procedures required for operational checkout, testing and troubleshooting.

The following special items are required:

- DC Power Supply
  - Specification: NFB Filtered DC Power Supply; Range: 0-32 Volts
- Test Cell with load measuring gauge
  - Specification: Capability to provide a force of at least 7,500 lbs.

**NOTE:** All test procedures in this section are mandatory. If testing cannot be completed as specified on site, the cargo hook may be sent out to an approved facility for testing.

**NOTE:** The Tables 11.6 and 11.7 referenced in this section are for the Type I model Solenoids and Type II model Solenoids, respectively. Solenoid Type should have already been determined as per the criteria outlined in Section 9.3.

### **11.1 PRELIMINARY INSPECTION**

- 11.1.1 Check that the Keeper is able to rotate in the necessary direction and firmly springs back to the closed position when released.
- 11.1.2 Apply hand pressure to the Load Beam and make sure it remains locked. While pressure is still being applied, rotate the Manual Release Knob. The Load Beam should unlock with ease.
- 11.1.3 From an unlocked position, check that the Load Beam is able to automatically return to a fully locked and closed position. If it does not, remove the Clock Spring Cover and adjust the tension of the Clock Spring as necessary.

**NOTE:** For the C3-K Model Remote Cargo Hook, the Clock Spring is set to have no tension, but remains fully adjustable depending on user requirements.

### **11.2 ELECTRICAL AND MECHANISM CHECKOUT**

- 11.2.1 Using a power supply, check the solenoid operation. Apply 24 – 28 volts to the solenoid for a maximum of 5 seconds. The solenoid should rotate freely.

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### **11.3 AIRWORTHINESS STANDARD**

- 11.3.1 Gradually apply force until the load reaches 7,500 LBS. (3401 kg) on the Load Beam.

**WARNING:**

DO NOT RELEASE THE LOAD AT THIS WEIGHT. SERIOUS DAMAGE COULD BE CAUSED TO PERSONNEL AND/OR EQUIPMENT.

- 11.3.2 Hold this load for two (2) minutes. Gradually reduce the load to zero.

### **11.4 CYCLE TEST**

- 11.4.1 Engage a poly-urethane rope or steel cable in the throat of the load beam. The load beam should be free to lock back into the closed position between cycles. Conduct the tests shown in either Table 11.6 or Table 11.7 at the end of this section. All tests must successfully pass.

### **11.5 VIBRATION TEST**

- 11.5.1 After the C3 Remote Cargo Hook has been cycle tested, apply a load of 3,000 LBS. (1,363 kg). Use a 1-inch shackle connected to the Load Beam to conduct this portion of the test.
- 11.5.2 Using a hammer, strike the shackle with a medium force ten (10) times. The C3 Remote Cargo Hook should not release the load.





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### 11.6 TEST SHEET: TYPE I MODEL SOLENOIDS

# of Releases	Load (LBS.)	Release Method	Remarks	Result	Pass/Fail
1	7,500	Static Hold	Hold for two minutes and reduce load to zero	N/A	
10	1,500	Electrical, 25 volts	No 'hang ups' permitted	N/A	
2	3,000	Electrical, 22 volts	Current shall not exceed 4.5A	Amp.	
2	2,500	Electrical, 22 volts	Current shall not exceed 4.5A	Amp.	
2	2,000	Electrical, 22 volts	Current shall not exceed 4.5A	Amp.	
2	1,500	Electrical, 22 volts	Current shall not exceed 4.5A	Amp.	
2	500	Electrical, 22 volts	Current shall not exceed 4.5A	Amp.	
1	3,000	Electrical, 20 volts	Current shall not exceed 4.1A	Amp.	
1	3,000	Electrical, 28 volts	Current shall not exceed 5.7A	Amp.	
1	3,000	Manual		N/A	
1	3,000	Impact Test	Impact Shackle 10 Times, shall not release	N/A	
1	N/A	Solenoid Ohm's	Shall not exceed 4.9 - 5.6 $\Omega$	Ohms	
1	N/A	Electrical Continuity	Across both wires	N/A	

**Table 11.6 - Test Sheet for Type I Model Solenoids**

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## 11.7 TEST SHEET: TYPE II MODEL SOLENOIDS

# of Releases	Load (LBS.)	Release Method	Remarks	Result	Pass/Fail
1	7,500	Static Hold	Hold for two minutes and reduce load to zero	N/A	
10	1,500	Electrical, 25 volts	No 'hang ups' permitted	N/A	
2	3,000	Electrical, 22 volts	Current shall not exceed 12.8A	Amp.	
2	2,500	Electrical, 22 volts	Current shall not exceed 12.8A	Amp.	
2	2,000	Electrical, 22 volts	Current shall not exceed 12.8A	Amp.	
2	1,500	Electrical, 22 volts	Current shall not exceed 12.8A	Amp.	
2	500	Electrical, 22 volts	Current shall not exceed 12.8A	Amp.	
1	3,000	Electrical, 20 volts	Current shall not exceed 11.6A	Amp.	
1	3,000	Electrical, 28 volts	Current shall not exceed 16.2A	Amp.	
1	3,000	Manual		N/A	
1	3,000	Impact Test	Impact Shackle 10 Times, shall not release	N/A	
1	N/A	Solenoid Ohm's	Shall not exceed 1.7 - 2.0 Ohm's	Ohm's	
1	N/A	Electrical Continuity	Across both wires	N/A	

**Table 11.7- Test Sheet for Type II Model Solenoids**

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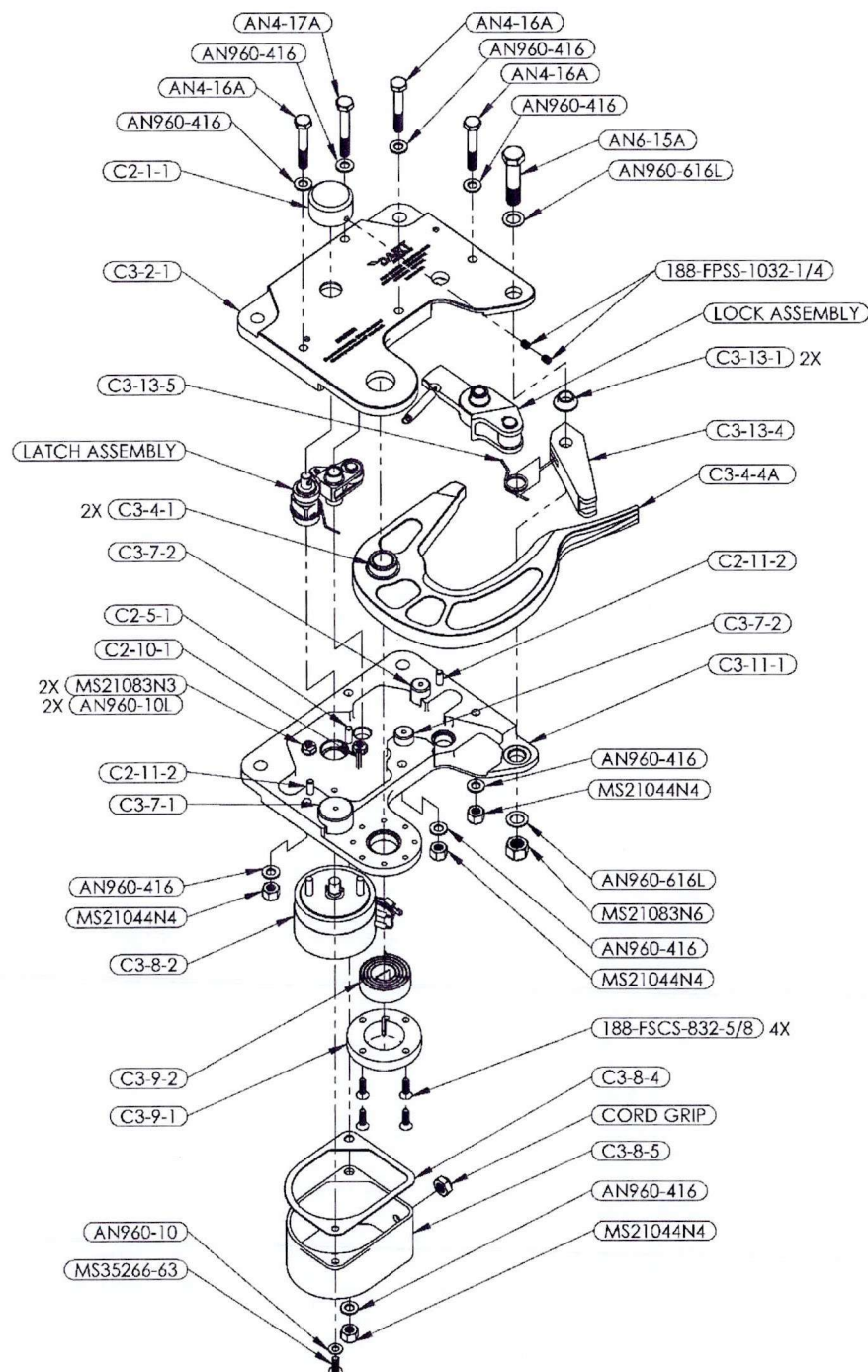


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## Appendix I: Assembly Figures

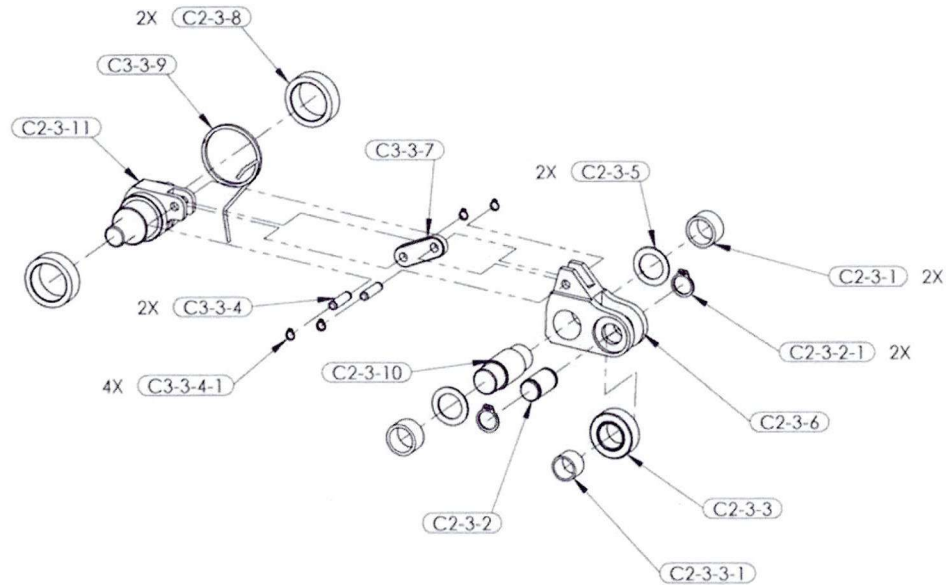
### Figure 1 - Exploded View



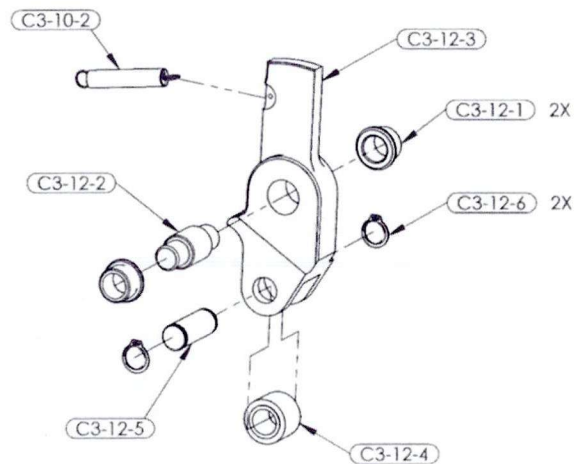
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**Figure 2 - Latch & Actuator Shaft Assembly**



**Figure 3 - Lock Assembly**

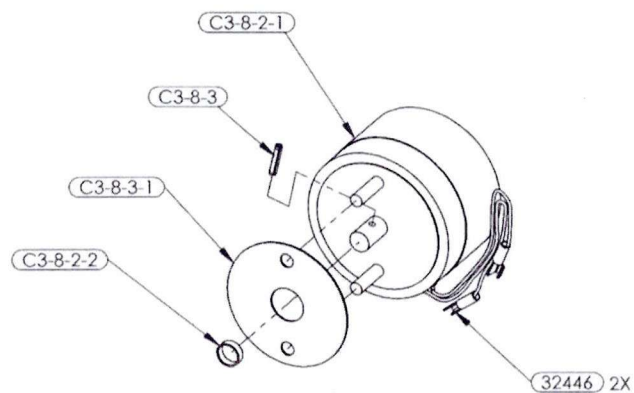




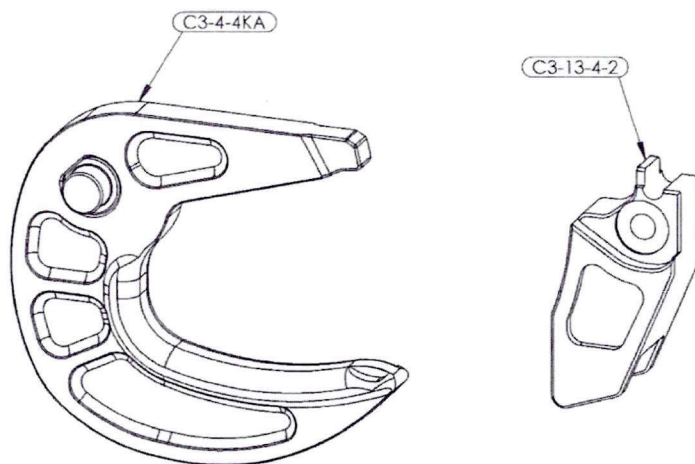
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**Figure 4 - Solenoid Assembly**



**Figure 5 - Keeperless Option**



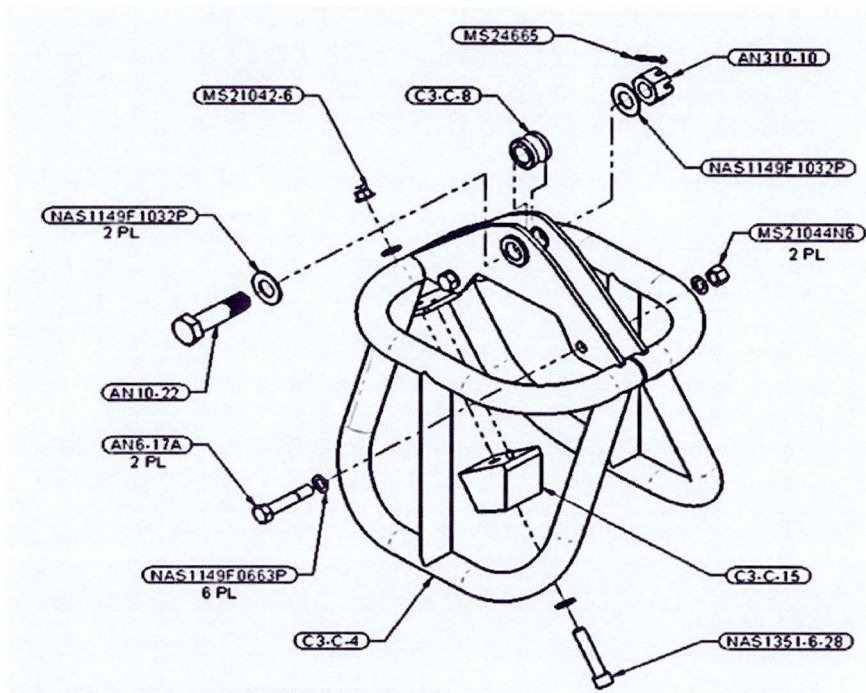
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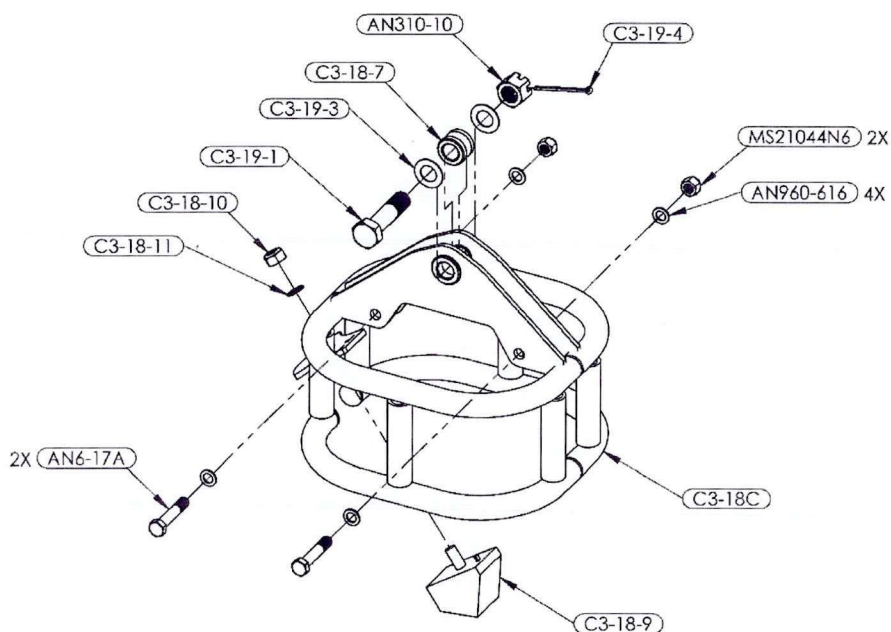
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**Figure 6 - Single Hook Cage (C3-C)**



**Figure 7 - Single Hook Ring Cage (C3-RC)**



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